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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/528,813	02/08/2006	Laura Zanibelli	268440US0XPCT	4196
22850	7590	01/07/2009		
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314				
EXAMINER				
SINGH, PREM C				
ART UNIT		PAPER NUMBER		
1797				
NOTIFICATION DATE		DELIVERY MODE		
01/07/2009		ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/528,813

Applicant(s)

ZANIBELLI ET AL.

Examiner

PREM C. SINGH

Art Unit

1797

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 February 2006.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-49 is/are pending in the application.
4a) Of the above claim(s) 31-49 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-30 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 22 March 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-8500)
Paper No(s)/Mail Date 01/26/07; 05/16/05; 03/23/05
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Group I, claim(s) 1-30, drawn to a process for oxidative desulfurization.

Group II, claim(s) 31-42, drawn to a catalyst composition.

Group III, claim(s) 43-49, drawn to a method for making a catalyst composition.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The corresponding technical feature shared by all of the groups is the catalyst composition.

The inventions are distinct, each from the other because of the following reasons:

Inventions in Group III and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make another and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process can be used to make another and materially different product, for example a hydrodesulfurization catalyst.

Inventions II and I are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different

product or (2) the product as claimed can be used in a materially different process of using that product. See MPEP § 806.05(h). In the instant case the process can be conducted by a materially different product, for example, a hydrodesulfurization catalyst.

Inventions in Group I and III are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different designs, modes of operation, and effects (MPEP § 802.01 and § 806.06). In the instant case, the process of oxydesulfurization and the process of making a catalyst composition are unrelated because they have different designs, mode of operation, feed, operating conditions, and end products.

International Preliminary Examination report submitted by the Applicant indicated that the catalyst compound is an obvious variant over prior art cited in the international application.

Accordingly, because the corresponding technical feature is obvious or not novel, and the claims in Group I, II and III are drawn to different inventions, the restriction is proper.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 27 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 27, the phrase "unique" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cabrera et al (US Patent 6,171,478) in view of Rabion et al, WO 01/48119 A1).

6. With respect to claim 1, Cabrera discloses a process for oxidative desulfurization of hydrotreated hydrocarbon mixtures boiling in a range of 149 to 538°C, containing 100-1000 wppm sulfur (See column 3, lines 20-38; column 4, lines 38-43; column 5, lines 9-11), which comprises:

(a) putting these mixtures in contact , in the presence of any suitable known aqueous oxidizing solution like acetic acid and hydrogen peroxide (See column 5, lines 55-62; column 6, lines 9-10), with a catalytic composition comprising a supported transition metal, a transition metal complex or a transition metal oxide (See column 6, lines 13-18); and

(b) separating the obtained corresponding sulfur oxygenated products from the hydrocarbon mixture (See column 3, lines 32-38).

It is to be noted that Cabrera invention uses the catalyst composition in a separate step after oxidative desulfurization step.

Rabion discloses a process similar to Cabrera for oxidative desulfurization of hydrocarbon mixtures, including gasoline, kerosene and diesel containing thiophenic sulfur (See page 2, paragraph 2, page 4, paragraph 1). Rabion also discloses using organic peroxide, hydrogen peroxide and peracids along with a catalytic composition formed by titanium, zirconium, vanadium, chromium, molybdenum, tungsten, iron, and manganese supported on silica, alumina, zirconia, aluminosilicates crystalline or amorphous and the aluminophosphates mesoporous solids, alone or in combination (See page 3, paragraph 2). Rabion further discloses the synergistic effect of combined action of oxidizing agents and the catalysts used (See page 3, line 1).

Thus, it would have been obvious to one skilled in the art at the time of invention to invention to modify Cabrera process and use the catalyst mixed with the oxidizing solution to simplify the recovery and separation of the reaction products including sulfur-oxidated compounds recovered from the oxidation zone and synergistic effect of combined oxidizing agents and catalysts used (See Cabreara, column 6, lines 18-21; Rabion, page 3, line 1).

Cabrera invention does not specifically disclose the claimed oxide matrix, however, the invention does disclose using supported transition metals. Rabion discloses the claimed transition metals as well as oxide matrix (See Rabion, page 3, paragraph 2).

7. With respect to claim 2, Cabrera invention does not specifically disclose that the surface of the catalytic composition has $-\text{O}-\text{Si}(\text{R})_3$ groups. However, Rabion

discloses catalyst support similar to the Applicant's claims (See Rabion, page 3, paragraph 2). Thus, it is expected that the catalytic composition of Rabion invention should necessarily have the claimed groups.

8. With respect to claims 3, 4, 8 and 9, Cabrera invention discloses using transition metal oxides which includes Ti, V, Zr and their mixtures (See column 6, lines 16-19)..

Although Cabrera invention does not specifically disclose using boron and/or gallium, it is known to those skilled in the art that boron and gallium are widely used as sulfur reduction additives (evidenced by Wormbecher et al , US Patent 5,376,608: column 1, lines 65-68; column 2, lines 1-2). Thus, it would have been obvious to one skilled in the art at the time of invention to modify Cabrera invention and add boron and/or gallium in the catalyst to enhance sulfur reduction in the process.

9. With respect to claims 5-7 and 15, modified Cabrera invention does not specifically disclose molar ratio of oxide matrix and the metal oxide in the catalytic composition, however, since the molar ratio of oxide matrix and the metal oxide is a result-effective variable, it would have been obvious to one skilled in the art at the time of invention to modify Cabrera invention and determine the optimum ratio for an effective desulfurization process. See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

10. With respect to claims 10-14, modified Cabrera invention does not specifically disclose the physical characteristics of the catalytic composition. Since Rabion invention

is using a catalyst similar to the Applicant's claim, it is expected that the physical properties of Rabion catalyst will inherently have similar physical characteristics as the claimed catalyst.

11. With respect to claim 16, Rabion invention does not specifically disclose catalytic composition as an extrudate, however, the invention does disclose using catalyst in the solid form (See Table 2) which should necessarily have been prepared by standard known techniques, including extrusion. Thus, it would have been obvious to one skilled in the art at the time of invention to use catalyst extrudates because any form and shape of the catalyst is expected to be equally effective.

12. With respect to claims 17 and 18, Cabrera invention discloses that any suitable known aqueous oxidizing solution, including hydrogen peroxide, may be used to perform the sulfur oxidation (See column 5, lines 59-62). Rabion invention discloses that any organic peroxide, hydrogen peroxide and organic hydroperoxides may be used (See page 3, paragraph 1). Thus, it would have been obvious to one skilled in the art at the time of invention to use any organic peroxide, including the claimed peroxides because they are all expected to be equally effective in the oxidative desulfurization process.

13. With respect to claim 19, Cabrera invention discloses that the process is carried out at a temperature between 38 and 149°C (See column 6, lines 3-5).

14. With respect to claims 20-22, Rabion invention does not specifically disclose the molar ratio of organic peroxide and sulfur, however the invention does disclose using 0.5 mmol of benzothiophene, 0.5 mmol of dibenzothiophene, 20 ml of n-decane and 1 ml of aqueous solution of 30 wt% hydrogen peroxide in an experiment (See page 5, paragraph 3). Thus, it would have been obvious to one skilled in the art at the time of invention to modify Rabion invention and determine the molar ratio of organic peroxide and sulfur. It is expected that the ratio will be in a range similar to the claimed range because Rabion is using a similar catalyst to oxidize thiophenes at the operating conditions similar to the claimed conditions.

15. Claims 23 and 24 have all the limitations of claims 19-22, and discussed above.

16. With respect to claim 25, Cabrera invention discloses that the process is carried out at atmospheric pressure (See column 6, lines 3-4).

17. With respect to claim 26, Cabrera invention discloses that the hydrotreated hydrocarbon mixture contains hydrocarbons boiling in the range of 93 to 565°C (See column 4, lines 38-43). Thus, it would have been obvious to one skilled in the art at the time of invention to use light cycle oil (LCO) as claimed, because its boiling range falls under Cabrera disclosure.

18. With respect to claim 27, Cabrera invention discloses that the process is carried out in an organic phase and in the absence of added solvent (See column 3, lines 20-38).

19. With respect to claims 28 and 29, Cabrera invention discloses that the separation of the obtained sulfur oxygenated products from the hydrotreated hydrocarbon mixtures is carried out by solvent extraction using any suitable known selective solvent including acetonitrile (See column 6, lines 35-39).

20. With respect to claim 30, Rabion invention does not specifically disclose the molar ratio of silica to alumina, however, the invention does disclose using silica and alumina in combination (See page 3, paragraph 2). Since the molar ratio of silica to alumina in the mixed oxide matrix is a result-effective variable, it would have been obvious to one skilled in the art at the time of invention to modify Rabion invention and determine the optimum ratio for an effective desulfurization process. See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Conclusion

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Herbstman et al (US Patent 3,565,793).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PREM C. SINGH whose telephone number is (571)272-6381. The examiner can normally be reached on 7:00 AM to 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/In Suk Bullock/
Examiner, Art Unit 1797

